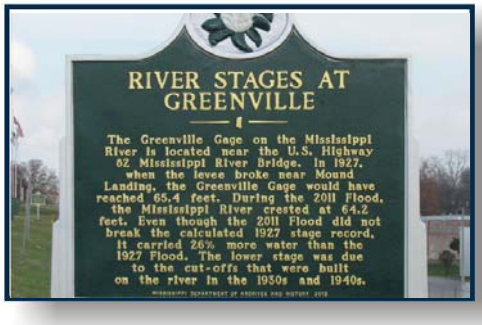
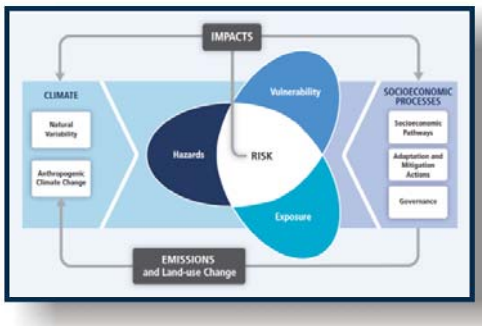
CSIR Contribution to Defining Adaptive Capacity in the Context of Environmental Change

4th Interim Report





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4th Interim Report

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1. INTRODUCTION

The Engineer Research and Development Center (ERDC), through its International Research Office (IRO), awarded grant number W911NF-14-1-0113 to the CSIR. The grant is based on the premise that human security and environmental security is inextricably linked and that a better understanding the relationship between human and environmental security will assist in reducing vulnerabilities and improving stability. The grant supports CSIR and ERDC research in adaptation to water-related impacts of climate change. The grant supports a comparison of historic human responses to environmental change in the Mississippi River and the Nile River, as measured by human security indicator datasets and environmental variability data. The overall goal is to measure regional adaptive capacity and thus understand how to facilitate regional stability that can withstand threats imposed by environmental impacts. Based on the outcome of this analysis, a set of metrics will be developed that will assist in measuring the adaptive capacity of a region based on past behaviour and capabilities to cope with physical or environmental changes.

The research is focused on understanding and identifying vulnerabilities in developing regions that inherently have fewer institutional capabilities to handle large-scale changes. The qualitative and quantitative analysis of adaptive capacity compares areas in the Mississippi and Nile Basin. The Mississippi case area serves as a more controlled case study with the Nile Basin representing a context with more limited historical data. Environmental change and human behavior over the hundred year time scale (1910-2010) are being used for the analysis. The comparison of environmental change (eg. precipitation and temperature trends) and the corresponding human behavioural responses (eg food access and migration patterns) will provide an input to metric creation, contingent on evidence that changes in local stability are related to environmental change. These metrics will be used to measure areas of vulnerability within both study regions.

2. PROJECT TASKS AND PROGRESS

2.1 Tasks

No.	Task	Description	Target date
1	Datasets	1.1 Inputs to environmental and human security datasets	31 Jan 2014
2	Data fusion	2.1 Data overlay	31 March 2014
2	Data fusion	2.2 Data analysis 2.3 Additional data collection	30 Sept 2014
3	Correlation	3.1 Compare results	30 Sept 2014
4	Metrics	4.1 Develop adaptive capacity metrics	31 March 2015
4	Metrics	4.2 Identify areas of vulnerability	30 June 2015

This report pertains to tasks 4.1 (Develop adaptive capacity metrics) and the progress related to 4.2 (Identify areas of vulnerability). The Tasks has been described as follows in the Project Plan:

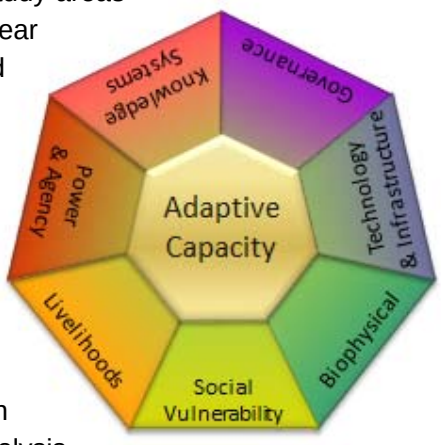
Task 4.1: Develop a set of metrics to measure human adaptive capacity based on successes and failures of past communities in both the Mississippi River basin areas and Nile River basin region of adapting to variability in the environment. This task will be conducted with support from the CSIR team.

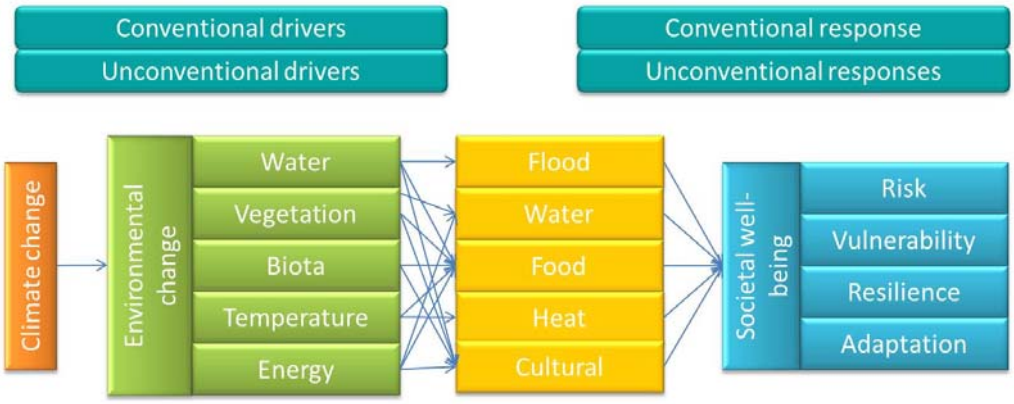
Task 4.2: Use the metrics to identify future areas of vulnerability within the Mississippi River basin and Nile River basin region. Utilize GIS to visualize these areas where there both exist opportunities for improving a community's adaptive capacity and potential for US military involvement. The CSIR will make inputs to the analysis.

2.2 Progress

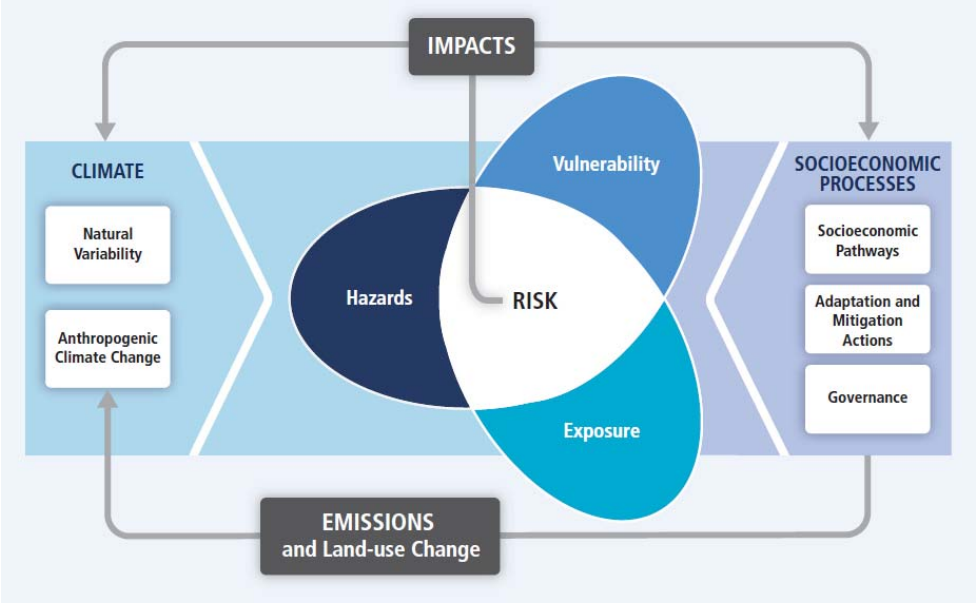
The project team worked on the tasks from their respective offices, but also utilized several opportunities for join work sessions. From the 24th to the 29th of August 2014, the CSIR team met with Ms. Veeravalli (ERDC) and Mr. Andrews (AFRICOM) in South Africa and Mozambique to work on the metrics related to Tasks 4.1 and discuss other issues of joint interest. The South African team members also visited the ERDC team in Washington DC from the 10th until the 17th of May 2015 to work on task 4.2. The team also had the opportunity to meet in the Seychelles from the 19th until the 23rd of June 2015 to develop the metrics further.

The CSIR support for the development of metrics to measure human adaptive capacity was based on the information collected for the case study areas in the Mississippi River and the Nile River. The 100-year history that was assessed in the earlier tasks provided a basis for the analysis, but also provided a practical context to evaluate existing frameworks, metrics and indicators. The evidence of societal adaptation to changes in environmental conditions in the Mississippi River basin areas and Nile River basin region focussed on significant events, such as floods and droughts, whereas adaptation to incremental change (such as changes in vegetation) were not evident from conventional information sources. The seven metrics that emerged from the analysis are indicated in the adjacent figure. The metrics are evaluated through a set of indicators that are drawn from different reporting frameworks, but are also filtered in terms of the relevance to the case study areas. In is envisaged that an assessment framework will be produced that will also facilitate the evaluation of adaptive capacity in other contexts. The draft outline of this framework is presented in the figure on the next page.





The metrics were used to identify areas of vulnerability within the Mississippi River basin and Nile River basin region. The IPCC (2014) simplified the relationship between climate and socio-economic processes and particularly the associated risk in the figure hereunder.



The opportunities for improving the communities' adaptive capacity (in accordance with the IPCC framework) relate to the reduction of the hazard, reducing the exposure to the hazard or reducing the vulnerability associated with the hazard. Whereas the reduction of the hazard (climate change mitigation) is important in the long term, this research is focussed on the exposure and vulnerability components. The analysis highlighted similarities and differences in the two case areas. In the Mississippi (Greenville) case, the river served as a trade and transport corridor, but also presented a risk through flooding. The chronology of adaptation in the Greenville case includes the extensive levee system, which reduced the risk of flooding, but also created a barrier between communities and

the river. Greenville was significantly affected by the diversification of transport and commerce, with subsequent socio-economic development challenges. In the Khartoum region of the Nile Basin, the 100 year history is more punctuated, with a complex political history being superimposed on instances of floods and droughts. While infrastructure was put in place to draw on the benefits from the river (e.g. irrigation and navigation) and protect communities from floods (e.g. levees), the ongoing political tensions had a negative impact on the sustainability of the infrastructure.

2.3 Red Flags

The work is progressing according to schedule.

2.4 What's next?

Following on from Task 4.1, the team will finalise Task 4.2 and focus on the publication of the following scientific papers related to the work:

- Human Security:, Vulnerability, Resilience and Adaptive Capacity: A Literature Review (ERDC lead)
- Adaptive Capacity: Theoretical Overview and Methodology (ERDC lead)
- An Integrated Framework of Adaptive Capacity (CSIR lead)
- Metrics and Indicators of Adaptive Capacity (CSIR lead)

3. COST AND PAYMENT SCHEDULE

3.1 Cost and Price

Type of Report	Due Date	Amount of
1st Interim Report	1 month after grant start date	$7,000.00
2nd Interim Report	3 months after grant start date	$13,000.00
3rd Interim Report	10 months after grant start date	$5,000.00 *
4th Interim Report	14 months after grant start date	$30,000.00 *
Final Report	18 months after grant start date	$5,000.00

** The third interim report was originally planned for $ 25 000, but the request for the advance was issued for $ 5 000. The balance of $ 20 000, was thus added to this (4th) interim report.*

3.2 Payment schedule

Invoices will be generated as per the deliverable dates based on approval of deliverables and transfers should be within 30 days of invoice receipt